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Safety

FLIGHT SAFETY AND TECHNICAL CONSIDERATIONS GUIDE FOR FLIGHT TESTING

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This pamphlet establishes a framework for the systematic development of flight test plans that consider and manage risk factors as an integral part of the overall test process. It provides a starting point for newly assigned test personnel to familiarize themselves with essential considerations in planning and executing flight tests. It is adaptable to testing associated with all phases of the acquisition process. This pamphlet applies to activities engaged in flight test programs. This pamphlet does not apply to the Air National Guard or US Air Force Reserve units and members.

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1. Purpose. This guide may be used for all flight test programs regardless of location, scope, or type. Participants in any flight test program should consider each portion of this guide applicable to their particular area and accept responsibility for ensuring that additional items are included as required. The guide is intended as a starting point and in no way should be considered all-inclusive. Common sense and professional judgment must prevail through the entire process of flight test planning and execution. This guide is best used to stimulate the thinking process. Its goal is to lead test participants to consider all risk factors that may be encountered and to take steps to reduce those factors once they have been identified. The position titles used throughout this pamphlet may vary among activities and test projects. However, the titles are intended to refer to persons performing like duties in their respective programs. The questions that follow are for the use of the task force commander, test director, project engineer, program manager, project test pilot, operations supervisor, instrumentation engineer, chase pilot, maintenance officer, weapons specialist, design engineer, flight safety officer, and system safety manager. Each person performing a test-related task has an opportunity to make a significant contribution to the overall safety of the project. The test team comprises individuals in a number of different areas of expertise; professionalism and cooperation of all participants is essential to the overall goal of identifying and reducing hazards before they can compromise the successful and safe completion of every test mission.

2. Flight Test Planning. The following questions are provided as general guidance for people preparing to conduct a test. They should be of particular concern to the test director, project engineer, program manager, project test pilot, and system safety managers:

2.1. Has the customer identified the responsible test organization and the participating test organization, as applicable?

2.2. Do all test participants understand program threshold and objectives?

2.3. Has a conference between test participants and personnel from the office that requested the test been scheduled?

2.3.1. Have safety representatives been notified?

2.4. Has the test been planned to avoid hazardous operation whenever possible?

2.5. Do all test participants understand the test equipment, test items, and software, including how they work and what they do?

2.6. Should flight familiarization sorties or simulator studies be conducted before flight testing?

2.7. Should crewmembers have simulator training in required tasks before flight testing?

2.8. Does the test program involve envelope expansion (operation near or beyond the extremities of the currently approved flight envelope)?

2.8.1. If so, has the test region been examined fully?

2.8.2. Can the results of other tests be used to expand participants' understanding of the test region?

2.9. Have critical structural parts been identified?

2.9.1. Has projected usage of critical structural parts during the test been compared to their predicted life remaining?

2.9.2. If projected usage approaches or exceeds life remaining, have special instructions or replacement intervals for critical parts been established?

2.10. Does the test require waivers of current restrictions on the vehicle, engine, or components to be used?

2.11. If waivers are required, are they technically sound and operationally justified?

2.12. Is the test schedule realistic?

2.12.1. Is the time allocated for testing adequate?

2.13. Has written clearance to deviate from established limits been obtained?

2.14. Have partial flight manuals been prepared according to MIL-M-007700D, *Flight Manuals*?

2.14.1. Have MIL-M-27733B, *Modification and Marking Procedures for Test Equipment in Aerospace Vehicles (Class II Modification),* and MIL-STD-882C/D, *System Safety Program Requirements*, been consulted as appropriate?

2.15. Is life support and personal safety equipment appropriate to the test available and ready for use?

2.15.1. Are participants familiar with the location and use of all such equipment?

2.16. For systems tests, have lower-level hardware and component tests been conducted?

2.16.1. Have the results been reviewed before a higher-level test?

2.16.2. Has simulation testing and analysis been conducted?

2.16.3. Has software testing and software integration testing been conducted?

2.17. Have test operations supervisory personnel agreed on the nature of the test?

2.18. Have all special support facilities (such as pace and chase aircraft, helicopter support, regular and special Aircraft Rescue and Fire Fighting (ARFF) support, special space positioning, site considerations, maintenance support, supply and logistical support, etc.) and associated hazards been clearly identified?

2.19. Are supporting activities prepared to respond to the needs of the program during the required time period?

2.19.1. Has contact been made with the local Air Force contract management office as necessary to obtain required support?

2.20. Is airborne interception, chase, photo, or formation flight planned?

2.20.1. Are briefings scheduled according to directives?

2.20.2. Will briefing guides appropriate to the planned inflight tasks be available and used?

2.21. Have airspace requirements for the test been thoroughly discussed with test operations, Air Traffic Control (ATC) and Federal Aviation Administration (FAA) personnel as necessary to ensure that all regulations and procedures for use of restricted and warning areas and positive control airspace are strictly followed?

2.21.1. Is there a need for a dedicated range controller?

2.22. Are altitudes and airspeeds planned to remain within the requirements of AFI 11-206, *General Flight Rules*?

2.22.1. If not, have waivers been requested and approved?

2.22.2. If local requirements must be waived, have steps been taken to do so?

2.23. Has the security classification for the program been considered with respect to operational capability, test items and equipment, and test data?

2.23.1. Will encryption be required?

2.24. Has consideration been given to the most suitable test site for this program, especially in terms of aircrew and aircraft safety and public safety?

2.24.1. Are all necessary facilities available (availability of data management resources) at the selected site?

2.25. Has the Federal Communications Commission been consulted in cases in which test items or equipment may raise electromagnetic compatibility (EMC) problems according to electromagnetic interference (EMI)/EMC requirements?

2.26. Is an on-site operations supervisor required for this test?

2.27. If a test director has not been designated, does the test plan specify who will direct the tests on a daily basis?

2.28. If the test involves use of a bailed, leased, or loaned aircraft or an Air Force preliminary evaluation, have arrangements been made for supervision of Air Force crews and responsibility for conducting the test?

2.28.1. Have frequency clearances been requested and received for the actual test site?

2.28.2. Has a waiver for supersonic flight been obtained as required?

2.28.3. Has a memorandum of agreement (MOA), which includes test plan, test conduct, test article limitations, mishap accountability /investigation/reporting responsibilities, crew responsibili-

ties, and pilot-in-command responsibilities or other agreement that details mishap accountability and reporting procedures been submitted to HQ AFMC at least 45 days before testing?

2.29. Are the tests compatible with other projects assigned to the test aircraft?

2.29.1. What test equipment will remain installed in the aircraft after completion of the test?

2.30. Has a firm checklist of all support items been prepared and coordinated (two-way radio-equipped vehicle at test site, special dollies, etc.)?

2.31. Have the best possible ground checks of test items and equipment been developed to detect malfunctions before flight?

2.32. Who has custody (accountability) for and will maintain the test items and support equipment?

2.32.1. If personnel other than those of the developing contractor will do maintenance on any test equipment, have they been adequately trained by the developing contractor?

2.32.2. Have they been trained to consider all potential hazards of all test items?

2.33. Does the test team understand that deviations from the approved test plan require prior supervisory approval?

2.34. Has the ARFF services at the test site been briefed on special features of the aircraft, such as special fuels, canopy release, seat and capsule safing, etc.?

2.34.1. Have any special tools or extinguishing agents that would be required for emergency egress been provided?

2.34.2. Have they been briefed on any special equipment used by crewmembers during emergency egress situations?

2.35. Has emergency egress training been accomplished? (Use any special equipment required for emergency egress in all such drills.)

2.35.1. Are any standard egress routes blocked by test equipment or design changes?

2.35.2. If so, can that equipment be repositioned without compromising the test?

2.36. If ground emergencies require repositioning the aircraft in safe or isolated locations, have such locations been designated in writing, agreed upon by all support services, and physically inspected for suitability?

2.37. If inflight emergencies require emergency evacuation of the test area or an emergency return to base, have appropriate emergency procedures been preplanned, coordinated with appropriate support organizations, and briefed to all participants?

2.37.1. Have lost communications contingencies been anticipated and briefed, especially for critical phases of each test sortie?

2.38. Have donning and use of special or protective equipment been considered for both routine and emergency situations throughout the test program?

2.38.1. If so, have practice sessions involving the use of such equipment been held?

2.38.2. Is recurrent training scheduled at normal emergency training intervals?

2.39. Have executive independent review team (EIRT) or safety review board (SRB) actions been completed and documented?

2.39.1. Have all participating commands, agencies, and services been involved in the review process as appropriate?

2.40. Test personnel having continuous real-time indications of critical flight indications will immediately notify test manager of parameters out side the accepted norm.

2.40.1. Will test personnel be able to detect faulty instrumentation indications of critical flight parameters?

2.40.2. Will they be able to identify trends that could result in exceeding such parameters?

2.41. Have definite go/no-go limits been established for minimum essential subsystems, weather, chase availability, instrumentation, and range support?

2.42. Is there a cockpit-mounted master power switch that can cut power to test equipment?

2.43. Has a lessons-learned file from similar tests been used for pre-mission planning and study (if available)?

2.44. Are test items, support equipment, and support personnel available within the command or will support from other commands be needed?

2.44.1. Do inter-command agreements (MOAs, test and evaluation master plans, program management directives, etc.) define the conditions under which such resources may be obtained and used?

2.44.2. Has mishap accountability been agreed on for each phase of the test (for example, deployment to the test location, non-test operations conducted by AFMC only or mixed crews, etc.)?

2.45. Has the program reviewed test plans and lessons learned from previous related test programs?

2.46. Are all participants reasonably certain the test can be conducted safely?

3. Operations and Supervision:

3.1. Has the test been discussed in detail, with special emphasis on bringing the benefits of past test experience to the current project?

3.2. Does the assigned project test pilot have the proper qualifications for the required missions?

3.2.1. Has the most qualified person available been assigned?

3.3. Have required aircrew checkouts been coordinated with the program office, contractor, or other responsible activities, with sufficient lead time to avoid adverse impact on the test project?

3.4. Has the project test pilot participated in the appropriate phases of test planning?

3.5. Have only those personnel, military and contractor, with mission need and proper qualifications been cleared to fly aboard test aircraft?

3.6. Has the safety review process satisfactorily identified all potential hazards and risk factors before the first test mission?

3.7. Is there a procedure by which current test results can be used as a basis for a stop-test decision when warranted?

3.7.1. Who has final authority to stop testing?

3.8. Have satisfactory arrangements been made for radio and space position monitoring, chase aircraft and mobile control vehicle utilization, photographic coverage, and quick-readout telemetry?

3.9. Who has on-the-spot go/no-go authority?

3.10. Have supervisors discussed with the project test pilot program objectives, techniques for data gathering, and specific tasks?

3.10.1. Are there better methods to obtain comparable data?

3.11. Do supervisors periodically review test mission profiles?

3.11.1. Is attention paid to emergency actions that may be required on each sortie?

3.11.2. Is the project test pilot adequately prepared to cope with test-related emergencies?

3.12. Have all persons flying aboard aircraft been provided personal survival gear appropriate to the test area and the test program?

3.13. Have test facilities been selected after considering safety, efficiency, cost, and likely results?

3.14. Have go/no-go limits been established for mission-essential subsystems, weather, chase availability, instrumentation, and range support?

3.14.1. Have alternate test points been planned and briefed to accommodate the degradation of one or more of these factors?

3.15. Has proper authority been established throughout the test facility, range site, and ATC activities before each flight (especially hazardous tests)?

3.15.1. Have all affected organizations been briefed on both primary and alternate mission test points?

3.16. Have all unresolved questions raised during test planning been answered to the satisfaction of all participants?

3.17. Have partial flight manuals and checklists been prepared and approved according to MIL-M-007700D and AFI 11-215, *Flight Manuals Program (FMP)?*

3.17.1. Do they address operating and safety issues?

3.18. Has MIL-M-27733B been complied with?

3.19. Are all supervisory personnel reasonably certain that the test can be conducted safely?

4. Project Test Pilot:

4.1. Does the project test pilot understand all test objectives?

4.1.1. Do all crewmembers understand the objectives, procedures, and data requirements that will be expected during each test mission?

4.2. Has the project test pilot thoroughly reviewed the flight test plan and given all suggestions for improvement to the project engineer?

4.3. Does the project test pilot know who has the final go/no-go authority for the project and for each day's mission?

4.4. Does the project test pilot know what deviations from the test plan may be allowed and who has authority to approve them?

4.5. Has the project test pilot reviewed the test methods and flight test techniques to be used to ensure that all available flying hours are converted into productive test time?

4.5.1. Is the project test pilot completely familiar with the techniques that will be required during each phase of the project, particularly those that involve extreme flight conditions and/or flight involving limited safety margins?

4.5.2. Are the flight test techniques the most appropriate for the test points they are intended to accomplish?

4.6. Is the project test pilot completely familiar with the configuration and operation of all installed test equipment and instrumentation?

4.7. Are the instrument controls easily identified and placed so they cause minimum interference, according to MIL-M-27733B?

4.8. Is the project test pilot satisfied with the system proposed for radio and space position monitoring, chase plane and mobile control vehicle utilization, and photographic coverage?

4.9. Does the project test pilot fully understand the scope of the test project, including what must be done and what is prohibited?

4.10. Do all crewmembers understand their duties?

4.11. Has the project test pilot thoroughly considered possible emergency situations, including emergency procedures that may have to be performed during various phases of testing?

4.12. Have all test missions been planned to generate the maximum amount of data in the safest possible way?

4.13. Is the project test pilot satisfied that all safety factors have been considered before the first flight?

4.14. Do the project test pilot and crewmembers have all the personal equipment items (survival and mission-related) that will be required for the test sorties?

4.15. Does the project test pilot understand all the operating limitations that may affect the vehicle, the engines, the software, and other components?

4.15.1. Is the project test pilot familiar with the likely effects of test-unique equipment that may change the flying qualities or performance of the aircraft?

4.16. If deviations from established limits are required, does the project test pilot understand which deviations are allowed and the hazards associated with them?

4.17. Has the project test pilot been briefed on the existence of any critical structural parts for each planned test maneuver and the potential hazard associated with failure of each critical structural part?

4.17.1. Has he/she planned emergency procedures in case of failure of a critical structural part.

4.18. Does the project test pilot have any reservations about the test as a whole, any planned test point or maneuver, or any supporting arrangements?

4.18.1. Has the project test pilot expressed these reservations to the test director?

4.19. Is the project test pilot mentally prepared?

4.19.1. Does the project test pilot need further familiarization with the test plan, through additional simulator time, flights, or ground training?

4.20. Is the project test pilot physically prepared for this mission?

4.20.1. If a high-G profile is anticipated, has the project test pilot had recent and sufficient exposure to high-G flight to recognize, manage, and avoid potential G-induced loss of consciousness?

4.21. If a high-G profile is planned, has the project test pilot allowed for sufficient fuel and mission time for G-awareness maneuvers and resting periods as necessary?

4.22. Has the project test pilot thoroughly briefed all other flying personnel concerning anticipated G-loads, emergency procedures (including ground and flight egress), and equipment stowage?

4.23. Has the project test pilot briefed the chase pilot on the program, expected flight conditions, peculiaities of the test or test aircraft, and pertinent observation points?

4.24. Have the critical parameters been correctly identified and instrumented? Does the test plan use a build-up approach in reasonable increments to reach the limit of the critical parameters?

4.25. Will the project test pilot be able to detect faulty instrument indications of critical flight parameters?

4.26. Has the project test pilot prepared partial flight manuals and checklists according to MIL-M007700D?

4.26.1. Have they been approved by Standardization/Evaluation according to AFI 11-215?

4.27. Are instrument flight rules flight plans complete if outside the local testing airspace?

4.28. Has a review of test points been conducted which place single-engine aircraft low and slow?

4.28.1. Do such test points place aircraft outside the window of a successful airstart before mandatory ejection altitude is reached?

4.29. During test sorties, are any automatic systems being disabled or bypassed?

4.29.1. If so, how is the project test pilot going to monitor and control those systems to ensure nominal operation and minimum hazard?

4.29.2. If the absence of an automatic system will affect an otherwise routine procedure for which the project test pilot has an established habit pattern, has the project test pilot tailored the checklist to verify operation and to prevent inadvertent omission?

4.30. Does the project pilot understand the general minimizing procedures, test unique hazards and alternate testing procedures?

4.31. Is the project test pilot reasonably certain that the test can be conducted safely?

5. On-site Test Director:

5.1. Is the on-site test director thoroughly familiar with the requirements of the test series?

5.2. Does the on-site test director understand all test objectives?

5.3. Has the on-site test director thoroughly checked the support requirements and verified that support equipment will be available at the test site when needed?

5.4. Has the on-site test director developed a plan of operation that follows and fully supports the approved flight test plan?

5.5. Do all participating personnel understand the plan of operation and what is expected of them?

5.6. Who is the go/no-go authority for each day's tests?

5.6.1. For the entire project?

5.6.2. What go/no-go criteria are under the on-site test director's authority?

5.7. Has the on-site test director considered using specialists (landing gear, engine, aircraft and test article systems, etc.) at the test site to help evaluate test progress and assess potential hazards?

5.8. Is accurate weather information required and available at the test site?

5.8.1. Does the on-site test director have an effective means of communicating weather data to crewmembers if they are some place other than the test site?

5.8.2. Does the on-site test director have an effective means of passing current weather information to crewmembers after they are airborne?

5.9. Does the on-site test director have a definite plan for inflight and ground emergencies, including emergency landing, bailout, inflight and ground fires, inadvertent jettisons, hung ordnance, fuel dumping, etc.?

5.9.1. Does the on-site test director have all the equipment at the site to deal with these emergencies?

5.10. Does the on-site test director have a plan for keeping the home base informed of test progress?

5.11. Is the on-site test director familiar with problems or unusual occurrences associated with operations at the intended test site?

5.11.1. Would any of them significantly affect the ability to conduct the test or react to potential problems?

5.11.2. If so, has the on-site test director considered relocating the most critical phases of the test to a more suitable site, if available?

5.12. Has the on-site test director determined what tests can be conducted when various instruments or combinations of them fail in flight?

5.12.1. Is the test director familiar with telemetry parameters which have been identified as critical for safety of flight as well as critical for safety of test.

5.13. Have all members of the test team, including maintenance and support personnel, been briefed on the tests to be performed and expected results?

5.13.1. Have they been given an opportunity to make inputs regarding potential hazards they have identified?

5.14. Have all required airlift arrangements been completed?

5.15. Have arrangements been made with flight operations at the test site for special clearances or deviations from standard operating procedures that may be required to accomplish specific test missions?

5.16. Have all arrangements for restricted areas, gunnery ranges, bomb or airdrop ranges, and range scheduling been completed before each test sortie?

5.16.1. If AFMC does not own the airspace required to conduct the test, has use of that airspace been coordinated with the owning agency?

5.16.2. Has conflict on use of the area been eliminated with other potential users?

5.17. Have special inspections or replacement intervals established for critical parts been complied with?

5.18. Has the aircraft been inspected for structural damage between high structural load demonstration points?

5.18.1. Has the aircraft been inspected for fragment damage following each live ordnance delivery sortie?

5.19. Are there procedures to protect people from injury (due to exploding components, etc.) following high-performance landing tests?

5.19.1. Will these procedures be sufficient to protect participants and nonparticipants (bystanders, persons off-base, uninvolved flight line personnel)?

5.20. Have arrangements been made to secure overtime authority or shift changes as necessary for civilian personnel supporting the test on-site?

5.21. Have safety, ARFF, operations, explosive ordnance disposal, and all other affected personnel at the test site been briefed on the test?

5.22. Has the scope of authority of the program manager and project test pilot been identified?

5.22.1. Is it clear which individuals have the authority to change checklists or deviate from the approved written test plan and when they may do so?

5.23. Have communication links been setup and tested with agencies providing emergency and technical assistance?

5.23.1. Is a communication link set up with operations group commander or equivalent?

5.24. Have arrangements been made to provide technical order changes and supplements, including time compliance technical orders (TCTO), to the test crew?

5.25. Is the on-site test director reasonably certain the test can be conducted safely?

6. Chase Pilot. The requirements of the product divisions may involve significant tailoring of these suggested areas of review. Mission needs should dictate the appropriateness of each consideration. Each mission's needs should be considered in isolation from previous missions to prevent inadvertent omission of a new element in the chase pilot's duties.

6.1. Does the chase pilot understand the objectives, procedures, data requirements, and sequence of events for each test sortie?

6.2. Has the chase pilot had a face-to-face briefing with the project test pilot?

6.2.1. Has the chase pilot discussed responsibilities with the project test pilot?

6.2.2. Does the chase pilot understand general risk minimizing procedures, test unique hazards and alternate testing procedures?

6.3. Has the chase pilot fully briefed the other flying persons concerning emergency procedures (including ground and flight egress), intercom failure procedures (including inter-cockpit hand signals), expected G-loads and when they will occur during the flight, and equipment stowage?

6.3.1. Has the critical nature of flight close to the ground (takeoff, landing, and maneuvering) been briefed to anyone who could inadvertently interfere with flight controls or with their own egress?

6.4. If a face-to-face briefing with the test crew is not possible, has the chase pilot planned for and participated in a thorough telephone briefing on mission profile and requirements? (A conference call involving as many participants as possible is desirable under these circumstances.)

6.5. In case of photo duties, is the chase pilot aware of the position that will provide the desired coverage and maximum safety?

6.5.1. Does the chase profile include avoiding the lead aircraft's wing-tip vortices?

6.5.2. Have there been any changes in the aerodynamic properties of the lead aircraft that could change the intensity or position of its vortices?

6.6. In case of photo duties, has the chase pilot confirmed that the photographer has all necessary equipment and that the equipment is compatible with the chase aircraft?

6.6.1. Is the equipment compatible in the event of ejection?

6.7. Have the chase pilot and the project test pilot reviewed hand signals as necessary?

6.8. Does the chase pilot know the specific items to be watched and the nomenclature of test articles or equipment so that radio transmissions during the test will be clearly understood by all participants?

6.9. Has the chase pilot been briefed on the existence of any critical structural parts for each planned test maneuver, their location in the structure, the potential hazard associated with failure of each critical structural part, and external indicators of their failure or impending failure, and planned emergency procedures in case of failure?

6.10. Has the chase pilot determined the approximate fuel quantity needed at various points of the flight?

6.11. Has the chase pilot filled out a chase mission briefing card, if required, and briefed the appropriate supervisors on the role and expected actions during the test?

6.12. Have the chase pilot and the project test pilot agreed on radio responsibilities, including air traffic control clearances, for the flight?

6.12.1. Is secure, encrypted communications required?

6.13. If the chase pilot is on an airspeed calibration (pacer) mission, has the chase pilot planned for an instrumentation preflight, verified the altimeter setting (29 .92 "Hg), and obtained an airspeed cross-check? (Notify test engineering on completion of a pacer mission.)

6.14. Chasing unmanned aerial vehicles (UAV) and remotely piloted vehicles (RPV):

6.14.1. Is the chase pilot aware of UAV/RPV capabilities, potential EMI, identification and location procedures, Flight Termination System (FTS) responsibilities and remote command and control (RCC) responsibilities?

6.15. Will chase aircraft's radar system interfere with test aircraft?

6.16. Will test points place chase aircraft outside its flight envelope or below dive recovery capabilities?:

6.16.1. Review which test points place chase aircraft low and slow (single engine aircraft) outside the window of accomplishing a successful airstart before mandatory ejection altitude is reached?

6.17. In the event of test aircraft damage, have the chase pilot and the project test pilot pre-coordinated emergency actions?

6.17.1. How close may the chase pilot get to the lead aircraft for a visual check?

6.18. Is the chase pilot reasonably certain that the flight and the test can be conducted safely?

7. Instrumentation Engineer. The following questions are provided as general guidance for people responsible for test instrumentation. These may include the instrumentation engineer, the project engineer, the test director, the project test pilot, the on-site test director, and safety personnel.

7.1. Has the instrumentation parameter list been completed and approved by flight test engineering?

7.1.1. Have Safety of Flight/Test parameters been identified?

7.2. Has the Modification Flight Manual been approved by flight test operations?

7.2.1. Are control panels and cockpit interfaces marked according to MIL-M-27733B and placed for effective operation?

7.2.2. Is the egress path clear?

7.2.3. Is the instrumentation master power switch accessible during critical phases of flight?

7.3. Has the instrumentation installation been documented and reviewed according to AFMCR 80-33, *Class II Modification of Aerospace Vehicles*?

7.3.1. Has the preliminary hazards analysis been reviewed by Flight Safety personnel?

7.3.2. Does the complexity of the modification design require a separate SRB?

7.4. Has the pilot been briefed on preflight inspection requirements for instrumentation appendages (nose booms, pitot heads, vanes, radomes, antennas, camera pods, sensors, etc.)?

7.5. Have the safety of flight/test parameters been properly calibrated and checked (from transducer to display) before each flight?

7.5.1. Are there provisions for emergency power for those systems noted as safety of flight critical?

7.6. Are all people associated with the instrumentation and test equipment reasonably certain that the test can be conducted safely?

8. Flight Safety Officer:

8.1. Have Class II modification procedures in DoDD 5000.1, *Defense Acquisition,* AFMCR 80-33, and MIL-M-27733B been complied with as necessary?

8.2. Is the size and weight of test equipment compatible with the aircraft?

8.2.1. Does it compromise flight safety?

8.2.2. Would any installed equipment impede emergency egress or ejection?

8.3. Have there been any changes to basic aircraft systems that could compromise safety (disabling of automatic systems, etc.)?

8.4. Have there been any changes to the external configuration of the aircraft that could compromise safety?

8.5. Are onboard power sources adequate to meet the loads imposed on them by test equipment?

8.5.1. Are correctly rated circuit breakers installed as necessary to handle additional loads?

8.6. Have weight and balance been recalculated for test equipment and the test item?

8.6.1. Are weight and balance within recommended limits?

8.7. Does the completed installation comply with the initial design, drawings, and specifications?

8.7.1. Have human factors and human engineering been considered in the installation of equipment and placement of switches that are to be operated in flight?

8.8. Do the installed racks and test equipment have projections (knobs, rivets, bolts, handles, or unfinished edges) that could injure people working on or within the aircraft?

8.9. Does instrumentation installed in the cockpit obstruct vision or add discomfort or distraction for the aircrew?

8.10. Is the aircraft properly placarded and has cockpit-mounted instrumentation been properly identified and marked?

8.11. Has a test equipment master power switch been installed in a readily accessible position in the cockpit?

8.11.1. Is it properly labeled?

8.11.2. Has it been tested?

8.11.3. Are adequate aircraft operation and maintenance instructions available to all people who need them?

8.12. Are test equipment checklists available for aircrew and ground personnel to use as required?

8.12.1. Are the onboard versions of such checklists a usable size?

8.13. Has the flight safety officer been fully involved in the review and coordination of the flight test plan?

8.13.1. Has the flight safety officer coordinated on all planned waivers?

8.13.2. If deviations from the approved test plan have been considered, have the proper review channels been used before implementation?

8.14. Have all SRB and EIRT actions been completed?

8.15. Has a partial flight manual been prepared according to AFI 11-215 and approved according to MIL-M-007700D?

8.16. If AFMC Form 243, **Temporary Release for Flight Certificate**, has been used, has the modification been isolated from the aircraft's other systems before the aircraft is released for flight?

8.17. Has the AFMC Form 244, **Class II Modification Configuration Control Board Directive**, been signed and approved before release for flight?

8.18. Have all required participant briefings been conducted?

8.18.1. Has maximum participation been achieved?

8.18.2. Have telephone briefings been held to the absolute minimum possible in favor of face-to-face briefings?

8.18.3. Have mission-related hazards associated with chase, pace, and other close-proximity flying been fully briefed?

8.19. Has responsibility for mishap accountability, investigation, and reporting been determined and coordinated through HQ AFMC/SE?

8.19.1. Have interim safety investigation board members been identified?

8.20. Have all participants had access to and made regular use of this pamphlet in planning and executing the test project?

8.21. Is the flight safety officer reasonably certain that the test can be conducted safely?

9. Maintenance/Logistics Officer:

9.1. Who will maintain the test item and all supporting test equipment? If personnel other than those of the developing contractor, have they been adequately trained by the contractor to consider all potential hazards associated with the test item and equipment?

9.2. Have aircraft modifications been approved and documented according to AFMCR 80-33 and AFMC Form 244?

9.3. Are there special maintenance procedures required to support the test? Are waivers required?

9.4. Have procedures been established to track actual usage of critical part life? Have special inspections or replacement intervals established for critical parts been complied with?

9.5. Have inspection requirements for the test item and equipment been compiled into preflight, thru-flight, post-flight, and phase and isochronal inspection workcards?

9.6. Have maintenance personnel been briefed on special aircraft launch and recovery procedures, including emergency situations?

9.7. Have tools, peculiar test equipment been identified and acquired?

9.8. If an item is to be loaded, carried, or dropped from an aircraft, has it been certified for carriage?

9.8.1. If not, has a waiver been obtained?

9.8.2. Have loading, checkout, and arming procedures been developed and approved according to local guidance?

9.8.3. Have load crews had ample time (when practical) for training, certification, and practice?

9.8.4. Is current loading and handling equipment adequate for the test project's needs or must it be modified?

9.8.5. Is suspension equipment adequate or must equipment be modified?

9.9. Have weight and balance entries been made and DD Forms 365-1, **Chart A--Basic Weight Check List Record**; 365-3, **Chart C--Basic Weight and Balance Record**; and 365-4, **Weight and Balance Clearance Form F - Transport**, been completed as appropriate?

9.10. Have overtime and shift changes been arranged for supporting maintenance personnel?

9.11. Have quality control specialists been briefed on test item and test equipment installation to include software upgrade/changes?

9.11.1. Has a joint inspection of the modification been made by quality control and flight safety personnel, the test project pilot, and the project engineer?

9.12. Has aircraft scheduling been coordinated with maintenance to ensure sufficient time to complete required modifications and other necessary maintenance before project start?

9.13. Have all aircraft historical records (AFTO Form 95, **Significant Historical Data**, and AF Form 2692, **Aircraft/Missile Equipment Transfer/Shipping Listing**, been checked and proper entries recorded?

9.14. Has the installation of test equipment been done according to approved drawings?

9.15. Does the installation comply with Air Force standards and MILM-27733B?

9.16. Have the proper entries been made in AFTO Form 781A, **Maintenance Discrepancy and Work Document**, for the start of the modification?

9.17. Have the wiring and structural changes been made according to approved drawings, applicable technical orders and pertinent military specifications?

9.18. Have areas in which modification was done been thoroughly inspected for potential hidden damage to flight and engine controls, cables, supporting members, and control surfaces?

9.18.1. Has AFTO Form 781A been annotated for the final inspection?

9.19. In the case of extensive modifications, has the aircraft been re-weighed?

9.20. Has the aircraft, and in particular the modified portions of the airframe, been thoroughly inspected for foreign objects?

9.20.1. If appropriate, were X-rays taken of the affected areas?

9.21. Are the aircraft checklist and flight manual current?

9.21.1. Do they contain a partial flight manual and checklist prepared according to MIL-M-007700D and approved according to AFI 11-215?

9.22. Have supplemental maintenance instructions been developed as necessary?

9.22.1. Have hazard analysis control measures (notes, cautions, and warnings) that affect maintenance been included in the appropriate maintenance instructions or technical orders?

9.23. Is maintenance support required at the test site?

9.23.1. If so, have arrangements been made to receive parts from supply or the developing contractor?

9.23.2. Is aircraft ground equipment or other unique support equipment required at the test site?

9.23.3. If so, how will it be transported there?

9.23.4. Have provisions been made to advise the maintenance team at the test site of any TCTOs that may be received at the home base during the test?

9.24. Who is in charge of joint Air Force and contractor maintenance support?

9.25. Have maintenance personnel been briefed on potential fire hazards associated with the test item and test equipment?

9.25.1. Are they familiar with means of combating fires during launch and recovery?

9.25.2. Is adequate ARFF first aid available at the test site?

9.25.3. Is ARFF support immediately available?

9.26. In the event of a mishap, are there procedures for notification of safety personnel?

9.26.1. If maintenance is to be performed at a test site away from home base, are eyewash stations, first aid kits, and other required safety equipment discussed in AFOSH STD 91-38, *Hydrocarbon Fuels General*, available to workers?

9.27. In the event of a maintenance-related mishap involving the aircraft, test item, or test equipment, who is responsible for securing the affected components?

9.27.1. Are there impoundment procedures?

9.27.2. Will the developing contractor support Air Force mishap investigations?

9.28. Are additional inspections required after certain test maneuvers have been flown? Certain test points (e.g., inverted spins) are within the flight envelope, but are outside the normal intended uses of the aircraft.

9.28.1. If so, repeated performances of these types of maneuvers may result in accelerated airframe or component wear.

9.28.2. What additional inspection(s) will be included?

9.28.3. What is the inspection interval?

9.29. Is staffing adequate to meet the requirements of the test?

9.30. Have maintenance personnel been given all reasonable opportunities to express concerns regarding their overall role in the project?

9.30.1. Are they reasonably certain that the test can be conducted safely?

10. Class II Modifications Checklist. The following questions are provided as general guidance for people preparing to conduct a test that will require a Class II modification to an aircraft. These issues should be of particular interest to the test director; operations supervisor; the project, design, and instrumentation engineers; the project test pilot; and the flight safety officer. All personnel must ensure that AFMCR 80-33 requirements have been met; these questions emphasize proper completion of some of the safety-critical tasks in that regulation:

10.1. Has a preliminary study been made of alternative designs that would optimize economy, flight safety, maintainability, and meet all project requirements?

10.2. Have applicable regulations on design and installation been reviewed before beginning modification work?

10.3. Have all affected personnel, such as project test crewmembers, project engineer, and flight safety staff, agreed on the location of test equipment in the aircraft?

10.3.1. Were human factors and human engineering considered in the placement of switches?

10.3.2. Will any proposed interior modifications impede egress or ejection paths?

10.4. Have the location and design of any additional antennas been reviewed and approved?

10.5. What effects will the installation have on aircraft weight and balance?

10.6. Will external modifications have any aerodynamic effects? Will lift, drag, thrust, or vortices be significantly affected?

10.7. Have aeroelastic studies been conducted to determine vibration limits in frequency and amplitude, if applicable?

10.8. Have structural analyses been performed to determine safe loads?

10.9. Can the aircraft's electrical system support the additional loads to be imposed on it by the test equipment?

10.10. Has the compatibility of radio and electronic countermeasure equipment been checked with the installation for frequency interference, etc.?

10.10.1. Has appropriate consideration been given to separating or shielding instrumentation and aircraft wiring, especially in the area of weapons system control circuits and electronic engine control components?

10.11. Have structural detail, assembly, and installation drawings been produced?

10.12. Have detailed wiring diagrams been produced?

10.12.1. Does wiring include a cockpit-mounted master power switch for all test equipment?

10.12.2. Do wiring diagrams avoid interface with aircraft wiring, including flight and electronic engine controls, to the maximum extent possible?

10.13. Has appropriate consideration been given to separating or shielding instrumentation and aircraft wiring, especially in the area of weapons system control circuits and electronic engine control components?

10.14. Have operating procedures and an inspection checklist been developed for the installation?

10.14.1. Is the size of the published operating procedure compatible with the aircrew position where it will be used?

10.15. Has the installation been done according to specific drawings and does it comply with Air Force standards?

10.15.1. Has wiring installation been done according to applicable technical orders and military specifications?

10.16. If there have been installation problems, has the modification design office coordinated on needed changes or adaptations?

10.17. Have the aircraft's AFTO Forms 781A been annotated appropriately to indicate the start and final inspection of the modification?

10.18. Have structural changes been made according to the aircraft's Dash Three handbook or engineering direction, as appropriate?

10.19. Has the installation been completed according to DoDD 5000.1, AFMCR 80-33, and MIL-M-27733B?

10.20. Have all pressurized areas that were disturbed during the modification process been properly resealed and tested?

10.21. Have areas in which modification was done been thoroughly inspected to verify that aircraft systems (flight and engine controls, control surfaces, etc.) were not damaged?

10.21.1. Have X-ray inspection techniques been used as appropriate to inspect for possible foreign objects in critical areas?

10.22. Will any external modifications affect airflow over pitot-static system components? Will the pitot-static system have to be recalibrated?

10.23. Has the installation been thoroughly ground checked before first flight in the modified configuration according to local procedures?

10.24. Will a flight check of the modified aircraft be conducted before test start?

10.25. Has a joint inspection of the modification been made by quality control, flight safety, maintenance, and modification design personnel and by the project test pilot?

10.26. Has modification approval been documented on AFMC Form 244 and AFMC Form 272?

10.26.1. Has the modification been annotated on the AFTO Form 781A following final inspection?

10.27. In the case of extensive modification, has the aircraft been re-weighed? Have all necessary entries (and updates, if required) been made on DD Forms 365-1, 365-3, and 365-4?

10.28. Have AFTO Forms 95 and AF Forms 2692, or their equivalents, been checked and appropriate entries been made to reflect the modification?

10.29. Has aircraft scheduling been coordinated to allow sufficient time to complete the modification before test start?

10.30. Has lead time been sufficient to meet project requirements?

10.31. Have partial flight manuals and checklists been prepared according to MIL-M-007700D and approved according to AFI 11-215?

10.32. Has a system safety hazard analysis of the modification been done according to AFI 91-202, *The US Air Force Mishap Prevention Program*, and MIL-STD-882C/D?

10.33. Has an AFMC Form 244 been signed and approved before the aircraft is released for flight?

10.33.1. Has an AFMC Form 243 been filled out if the aircraft is to be flown before the modification is complete?

10.33.2. Is the aircraft safe to fly in its current state?

10.34. If an AFMC Form 243 has been approved, has the modification been isolated from all aircraft systems before release for flight?

10.35. When testing is to be done away from the home base, are the limits to the authority of the test director and project test pilot clear?

10.35.1. Is it clear that no checklist changes or deviations from the approved modifications or written test plan may be made without the approval of the wing commander or the SRB. as appropriate?

10.36. If the aircraft is on loan to AFMC for the test, will the demodification be performed according to AFMCR 80-33?

10.37. Are all people involved in the approval and execution of the modification reasonably satisfied that the proposal will meet the requirements of the test, that the modification has been executed properly, and that the aircraft is safe to fly?

11. Flight Testing of Aircraft Munitions and Weapons. The following questions are provided as general guidance for people preparing to conduct a test involving munitions or weapons. These questions should be of particular interest to the operations supervisor, test director, project engineer, project test pilot, maintenance personnel, weapons specialists, weapons safety specialists, and the flight safety officer:

11.1. Has the weapon been approved for testing by the Nonnuclear Munitions Safety Board (NNMSB) as required by AFI 91-205, *Nonnuclear Munitions Safety Board*?

11.1.1. Have munitions test sets been approved by the NNMSB?

11.2. What are the limits for carriage of the munitions?

Airspeed/Mac _____

Gs:(+) _____ (-) _____

Roll rate _____

11.3. What are the release limits (altitude, roll, yaw, and pitch) for the munitions?

Safety separation altitude:_____

For jettison: _____

Mach ____

G's:(+)_____(-) _____

11.4. How have all these limits been established (analytical methods, wind tunnel tests, previous flight tests)?

11.4.1. Are any operational limitations in effect for any of the weapons (such as, temperature exposure, pressure, etc.)?

11.4.2. What subjective degree of confidence is there in these limits?

11.5. Has the responsible Air Force Development Test Center activity or system program office approved all these limits?

11.6. Will the munitions be stable when released

11.6.1. If stability is questionable, will the test begin below the limits for the particular type of release and work up incrementally to the desired flight conditions?

11.7. When stability of the munitions on release is questionable, has photo coverage of each release been arranged for post-mission study? (The fin arrangement and center of gravity (CG) relationship to the ejection pistons must be studied to assess release characteristics. For pods and tanks in which the load may vary, the CG must remain within acceptable limits.)

11.8. Does the CG of the aircraft remain within limits for the various configurations tested?

11.9. Is the planned configuration authorized for the test aircraft; that is, are the weapon variation weights compatible with the aircraft's weight limitations?

11.10. Are simulation studies necessary to ensure safe separation?

11.11. Have funds and manpower for the test project been properly documented?

11.12. Have data requirements been documented?

11.12.1. Has support been arranged at the selected test range?

11.12.2. Have all requirements been provided in writing to the range and the collection facility?

11.13. Has a format been established for presenting reduced data?

11.13.1. Has that format been specified in writing to the data reduction facility?

11.13.2. Is an Air Force data analysis plan required for these tests?

11.14. Has a waiver been received from the program manager or system support manager to exceed aircraft flight manual limitations, if necessary?

11.15. Have communication procedures been established between the on-site test director and flight test operations to coordinate changes and transmit weather data and go/no-go decisions?

11.16. Have the crewmembers and chase pilot been briefed on all phases of the test mission?

11.17. Have operating instructions and a checklist been created to cover operation of installed test equipment? Is the size of the checklist compatible with the crew position where it is to be used?

11.18. Have the procedures in AFJI 11-204, *Operational Procedures for Aircraft Carrying Hazardous Materials*, and AFMAN 24-204, *Preparing Hazardous Materials for Military Air Shipments*, been reviewed for handling and transporting hazardous or explosive cargo?

11.18.1. Do all munitions or explosive items have a valid interim or final explosive hazard classification?

11.19. Are any special precautions required during the loading of the munitions or weapon?

11.19.1. Has an area been identified for loading that will minimize hazard to surrounding personnel and facilities, if forward firing munitions or toxic agents are involved?

11.20. If the munitions is to be ignited or detonated by radio signals, has a frequency been allocated?

11.20.1. Have arrangements been made to monitor the selected frequency during loading to verify it is clear?

11.21. Is restricted airspace required to perform the test mission?

11.21.1. If so, what local range limitations, restrictions, and operating procedures apply?

11.21.2. Will any of these restrictions impose adverse effects on the test?

11.22. What outside agencies are involved in the test program?

11.22.1. Have points of contact been identified in each agency?

11.23. Is in-house test support available during the proposed test period?

11.24. What is the security classification of the test item?

11.24.1. Does the security classification or explosive hazard classification of the test item require designation of a special assembly or loading area?

11.24.2. If so, has an area been identified in writing and precoordinated with appropriate agencies?

11.25. What is the type and amount of explosive in each test item?

11.25.1. Have all agencies concerned been informed about the explosives hazard factor and the location of the loading area?

11.26. Have all handling and loading precautions in AFMAN 91-201, *Explosive Safety Standards*, been observed?

11.27. Have all crewmembers been briefed on the explosives content and hazard factor of the test item?

11.28. Has a procedure for handling explosives been developed and coordinated with explosives and flight safety personnel?

11.28.1. Are the munitions and weapons characteristics known by range safety personnel?

11.29. Will special precautions be required during the recovery of expended munitions?

11.29.1. If so, have all participants in the recovery process been briefed on the hazards involved and provided with suitable equipment and personal protective gear?

11.30. Is suspension hardware that is compatible with the test item available at all required locations?

11.30.1. Is suspension hardware and carts NNMSB-approved?

11.30.2. If necessary, can suspension hardware be modified to support the test project?

11.30.3. If not, can special hardware be designed and made to meet the time constraints of the project?

11.30.4. Have the special hardware modifications been aproved by the item manager?

11.30.5. Do the proposed modifications need NNMSB approval?

11.31. Has jettison capability been considered for heavy captive carry items?

11.31.1. If not, what is the rationale for accepting the added risk of carrying such nonjettisonable items?

11.32. Is equipment for handling weapons adequate for loading and downloading the test item?

11.32.1. Can the equipment be modified to accommodate the test device as necessary?

11.32.2. Do the proposed modifications need NNMSB approval?

11.33. Have operating instructions and a checklist been prepared to cover operation of specially fabricated or purpose-built handling equipment?

11.34. Is a load analysis necessary to ensure aircraft structural integrity for the conditions to be imposed during the test?

11.35. If electrical devices, wiring, or squibs are used, have appropriate safety analyses been performed to check for such hazards as stray voltages, inadequate safety devices, etc.?

11.35.1. Is the munitions properly protected against inadvertent ignition through use of safe arm devices, twisted shield squib leads, etc.?

11.35.2. Will the munitions or item be exposed to a high radio frequency (RF) radiation environment?

11.35.3. If so, has the munitions or item been properly shielded?

11.36. Will instrumentation or suspension and release requirements necessitate aircraft modification?

11.36.1. If so, have the modifications been properly done and has the review process described in this pamphlet been used?

11.36.2. Have weapon system software upgrades been coordinated according to local procedures?

11.37. Have aircraft taxi routes been surveyed and confirmed safe for use?

11.37.1. Do they avoid pointing forward-firing weapons toward populated areas?

11.38. Have safety areas for arming and de-arming been designated in writing and precoordinated with supporting agencies and weapons safety office?

11.38.1. Have grounding points been established and recently certified by civil engineering?

11.39. Are aircraft control problems anticipated during takeoff? (Large asymmetric loads on outboard wing stations increase aircraft minimum control speeds.)

11.39.1. Consideration should be given to increasing nose wheel liftoff and takeoff speeds.

11.39.2. If inflight asymmetric configurations need to be tested, consideration should be given to taking off with symmetrical stores and jettisoning a store in flight to establish the required configuration.

11.40. Will runway sweeping be required after take-off, before landing, or after landing?

11.40.1. If so, has such support been precoordinated?

11.41. Are roads near the takeoff end of the runway to be blocked during takeoff? If so, has security police support been precoordinated? (Armament switches must be safe or off until the aircraft is over the range area where the munitions or weapon is to be tested.)

11.42. Are emergency jettison areas, if needed, available to the pilot immediately after takeoff?

11.43. Does the air route to the selected range avoid populated areas, radar beams, and areas of high RF intensity?

11.44. Have switches that must be used in critical phases of flight been made readily accessible and kept to a minimum? (During low altitude, high-speed flight, or steep dives the pilot must not be required to look into the cockpit or let go of the primary flight controls.)

11.45. Have ordnance release and pullout altitudes been calculated to allow for safe ground clearance?

11.45.1. Will there be sufficient separation from the ordnance during pulloff?

11.45.2. Has the fragmentation pattern been predicted and taken into consideration in these calculations?

11.46. Have delivery and run-in profiles been planned to minimize the danger of ricochets?

11.46.1. Is there a need to develop proposed footprint data?

11.47. Have instrument lag and position errors been considered in planning test deliveries?

11.48. Will the flight path cross over public highways, civilian population centers, personnel or equipment after the switches have been configured for ordnance release?

11.49. Have jettison areas been identified in the vicinity of the selected test range?

11.49.1. Is the pilot familiar with the location of these areas and the procedures to be followed during jettison?

11.49.2. Are jettison characteristics known?

11.50. Has a hung ordnance pattern been established at the home base, test site, or alternate recovery bases?

11.51. Is the ordnance safe to land with or must it be jettisoned before landing?

11.52. Will the aircraft's maximum gross landing weight be exceeded?

11.53. Will sufficient runway be available at the intended landing base to permit a stop without use of a drag chute?

11.54. If the aircraft will be landed heavy, has the need for an early go-around decision been stressed to crewmembers?

11.55. Have safe approach routes and a clear straight-in approach corridor been established for landings with test ordnance?

11.56. Have post-flight recovery procedures and precautionary instructions been provided to expended missile or weapon recovery teams?

11.57. Have ARFF personnel been briefed on possible impediments to fire-fighting involving test munitions?

11.57.1. Have safe angles of approach, stay times, and toxic effects been evaluated and agreed on?

11.58. Have pertinent data on the test item or similar ordnance been obtained from other agencies (Army, Navy, Marines, or foreign users) when available?

11.59. Are all participants reasonably certain that testing of the munitions or weapons can be conducted safely and that the aircraft's configuration is appropriate to the desired test profile and outcome?

12. Air-to-Air Missile Testing. The following questions are provided as general guidance for people preparing to conduct an air-to-air missile test. Users should first refer to paragraph 11 for applicable questions, then review the following questions. The following questions should be of particular interest to the operations supervisor, test director, project engineer, project test pilot, weapons specialists, and maintenance and safety personnel:

12.1. Are the directives current that pertain to storage, assembly, checkout, transporting, loading, launching, jettisoning, and downloading of the missile being tested? If so, are the directives available to all test participants?

12.2. Have ARFF, and disaster response personnel been trained and briefed on the nature of the test and its hazards?

12.3. Have the project crewmembers been trained?

12.3.1. Is their supervision adequate?

12.3.2. Are they thoroughly familiar with the test plan and the tasks to be performed on each sortie?

12.4. Have current aircrew checklists been developed for armament preflight inspection, inflight safety checks, arming, firing, safing, hang-fires, system malfunctions, jettisoning, hung ordnance landings, and landing with and downloading the missile?

12.5. Are all crewmembers familiar with the range facilities, targets, hazards, and safety precautions required enroute to and within the airspace where the test is to be conducted?

12.6. Have the target and ground controllers, both airborne and ground-based, been briefed on the procedures and objectives of each test sortie?

12.6.1. Are they thoroughly familiar with range facilities, procedures, hazards, and limitations?

12.7. Is there a requirement to provide data or other procedural information to range personnel?

12.7.1. If so, have arrangements been made to do so before test start, with sufficient time for range staff review?

12.8. Is national range documentation required?

12.8.1. If so, does it reflect the exact support required for the test program?

12.9. Has the test been properly documented and submitted to HQ AFMC for review?

12.9.1. Have engineering service plans been prepared as necessary?

12.9.2. Are management reports required?

12.9.3. If so, who is responsible for them and when are they due?

12.10. Are there procedures for launching and recovering drone targets?

12.10.1. Are there provisions for recovering or destroying damaged drone targets?

12.10.2. Who has destruction authority?

12.11. Are there facilities for storage, assembly, checkout, transporting, loading, launching, jettisoning, and downloading the armament being tested?

12.12. Have ground crews been trained in handling the test armament?

12.12.1. Do they have adequate supervision?

12.13. Are checklists for handling the test armament available to and used by ground crews?

12.14. Have adequate voice communications, including facilities, frequencies, and procedures, been prepared and confirmed before test start?

12.15. Will a qualified test director be present at the mission control site during each test sortie?

12.15.1. Have contingency plans for emergencies and test deviations been prepared and made available for the test director's use at the mission control site?

12.16. Have all participants been briefed on hold and go/no-go criteria for test missions?

12.17. Are accurate weather data required for safe execution of the test?

12.17.1. If so, have arrangements been made to have the most current weather data available to participants on a real-time basis throughout the test period?

12.17.2. Are weather data available on the test site available to personnel at the home base and at the mission control site?

12.17.3. If weathership aircraft could be required before launching the test aircraft, have the aircraft and the aircrew been precoordinated and briefed?

12.18. Have briefing procedures been established that will enable all participants to become familiar with the profile and objectives of each test flight, including hazards and possible emergencies?

12.19. Is there any danger of the missile impacting outside the test area?

12.19.1. If so, have alternate locations for the test been considered?

12.19.2. If not, has sufficient assessment of the potential risks to persons or property not associated with the test been made before beginning the test?

12.20. Is there any danger of the aircraft that launches the missile having a flameout from missile exhaust ingestion?

12.21. Is there a sufficient number of separate and independent means of terminating the flight of the missile should the need arise?

12.22. Will debriefing data, such as results, unforeseen events, and potential problems, be assembled for reference and consideration in the planning of future flights?

12.22.1. What procedure will be used to ensure the use of such information?

12.23. If inert air-to-air missiles or rockets are to be fired as infrared targets, have ballistic, safety, and flight profile analyses been completed and documented before test start?

12.24. Are safety pins or ground safing devices available to safe the weapons if the test aircraft has to divert to an alternate landing field?

12.24.1. Are adequate checklists available to properly safe the aircraft?

12.25. Are all participants reasonably certain that the test can be conducted safely?

13. Tests of UAVs or RPVs:

13.1. Who has authority for initiating FTS/RCC commands?

13.2. Does the FTS/RCC comply with on-range doctrine or standards for utilization?

13.3. Has the FTS/RCC been properly designed, installed and evaluated to minimize failure?

13.4. Have emergency recovery procedures and techniques been defined and briefed?

13.5. Have hazardous footprints been developed either from analytical methods, computer simulation or previous flight tests to define safety zones before testing?

13.6. When possible, have debris dispersion predictions been calculated by analytical method or computer simulation before testing?

13.7. What does the vehicle do when the FTS or telemetry signal is lost?

13.8. Is a chase required/feasible for the test?

13.9. How will the airspace be cleared of other traffic?

13.10. What sources of information are available to provide vehicle position and what will the program do as each source is lost while the vehicle is airborne?

13.11. Does FTS activation present any environmental/explosive hazards (fuel dumping, burning of composite materials upon impact, detonation materials handled during pre/post flight)?

13.12. What level of manual control of the RPV/UAV is available?

13.13. Have FAA waivers been obtained for UAV flight without chase outside of a restricted area?

13.14. Have mishap accountability/investigation/reporting responsibilities been clearly documented and are understood by all participants?

13.15. Are all participants reasonably certain that the test can be conducted safely?

14. Adverse Weather Testing. The following questions are provided as general guidance for people preparing to conduct an adverse weather test. The program should also reference paragraph 15 if applica-

ble. The questions should be of particular interest to the test director, operations supervisor, project test pilot, project engineer, instrumentation engineer, chase pilot, and maintenance and safety personnel:

14.1. Have all hazards and precautions required for safely conducting the test been addressed in the approved written test plan and reviewed by all participants?

14.2. Have test profiles been developed that would permit at least some test objectives to be achieved in the event of some instrument failures?

14.3. Have emergency procedures in the event of identification friend or foe (IFF), radio, radar, navigation, or other equipment failures been planned and thoroughly briefed?

14.4. Have precautions been taken to avoid over-stressing the aircraft in severe gust loads; losing control of the aircraft during penetration of severe storms, turbulence, or heavy precipitation; or losing control authority in high-altitude environments?

14.5. Has degradation of communications in areas of severe weather been anticipated?

14.5.1. Have compensatory measures (communications relay aircraft, planned lost communications escape/return-to-base maneuver or signal, etc.) for this degradation been planned and briefed?

14.6. Has a safety chase aircraft been scheduled to observe artificial icing and rain tests?

14.7. Has the chase pilot been briefed on mission hazards, midair collision avoidance awareness, and possible responses to disorientation or blinding of the project test pilot during the test?

14.7.1. Have contingency responses to loss of test aircraft engine, pitot-static indications, and artificial control feel been preplanned and briefed?

14.8. Have maintenance personnel been briefed and equipped to respond to, inspect, and, if necessary, cool aircraft brakes and landing gear during braking and fast-stopping tests?

14.8.1. Have written procedures for how personnel are to respond to such problems been developed, approved, and given to all participants?

14.8.2. Does each member of the maintenance crew understand the hazards involved with the test and the specific tasks that may be needed to prevent damage to the aircraft or injury to people working around it?

14.8.3. Have safe-approach routes been planned and coordinated with all personnel who need to respond to a hot-brakes situation?

14.9. Have preparations been made for barrier engagement in case brakes are insufficient to stop the aircraft?

14.9.1. Is barrier condition an element in the test director's go/no-go checklist?

14.10. Has appropriate ARFF support been arranged and briefed before test start?

14.11. Has the flight safety officer been included in the coordination and conduct of mission-related communications during hazardous tests?

14.12. Have flight manuals and equipment-operating instructions been reviewed for limits of operation that may be encountered in the course of adverse weather tests, such as windshield heat, pitot heat, and anti-ice?

14.12.1. Has failure of these subsystems been considered in preplanning the go/no-go checklist?

14.13. Has the project test pilot anticipated and planned for the loss of pitot-static indications (airspeed and altitude) during the test sortie?

14.13.1. What initial actions will be taken?

14.13.2. Will a chase aircraft be in the area of the test or available to respond to an emergency involving test aircraft loss of flight instrumentation?

14.14. Are there procedures for special foreign object damage inspections following sorties involving ice, sand, and dust?

14.15. Have all participants been issued cold-weather clothing as appropriate?

14.16. Have ejection, rescue, and emergency recovery and landing procedures been preplanned and briefed?

14.16.1. If rescue support may be required during hazardous tests or in severe weather, have the appropriate rescue agencies been informed of the location and expected duration of the test?

14.17. If special lubricants will be needed for the test, have they been obtained before test start in sufficient quantity to permit completion of all required test sorties?

14.18. Has test equipment and associated instrumentation been designed to work in the climatic conditions expected?

14.19. Have all identifiable risks been satisfactorily addressed and reduced or accepted?

14.19.1. Are all participants reasonably certain that the test can be conducted safely?

15. Extreme Temperature Testing. The following questions are provided as general guidance for people preparing to conduct extreme temperature tests. The questions should be of particular interest to the test director, operations supervisor, project engineer, project test pilot, instrumentation engineer, and maintenance and safety personnel:

15.1. Have all participants reviewed specifications to determine the environmental limitations on the aircraft to be tested?

15.2. Has test equipment and instrumentation been qualified for operation at extreme temperatures (+ 125 degrees Fahrenheit to - 65 degrees Fahrenheit)?

15.3. If not, are there provisions for heating or cooling the equipment as necessary?

15.4. Have adequate spares, support, and test equipment been set aside to complete this project?

15.5. Has suitable equipment been issued to all personnel participating in arctic tests?

15.6. Have plans for tie-down of the aircraft in the climatic laboratory been coordinated with all participants and affected agencies?

15.7. Does the design of the tie-down provide maximum safety?

15.8. Have planners considered placing barriers around aircraft tested in the climatic laboratory to provide additional safety for people working in the vicinity?

15.9. Have people participating in arctic tests been fully briefed on cold-weather and arctic survival?

15.10. Have people participating in arctic tests passed the required pre-deployment physical examination? Are their immunization records current?

15.11. Has the number of people exposed to climatic extremes been reduced to the minimum practical for successful test performance?

15.11.1. Would it be practical to distribute the assignment of specific tasks among a number of participants to minimize the exposure of certain people?

15.12. Has an operations plan been prepared and coordinated for deployment of an arctic or desert task force?

15.13. Are there procedures to ensure that participants receive publications changes, including TCTOs, at their deployed location?

15.14. If special lubricants will be required for the test, have they been stockpiled in sufficient quantity to last for the deployment or testing period?

15.15. Have provisions been made to manage communications failure in the climatic laboratory?

15.16. Have all participants been briefed on those alternate measures?

15.17. Are there procedures established for conducting foreign object damage inspections in the climatic laboratory before and after each test?

15.17.1. Who will be responsible for these inspections?

15.17.2. How will they be documented?

15.18. Have all participants been briefed on the hazards of touching metal surfaces that have been subjected to temperature extremes?

15.19. Have arrangements been made with the climatic laboratory safety staff to brief all participants on hazards before test start?

15.20. Have all personnel been briefed on who is in charge during climatic laboratory test runs?

15.21. Are there any unabated hazards that should be reviewed before test start?

15.22. Are all participants reasonably certain that the test can be conducted safely?

15.23. Has a thermal stress index been adopted for use to limit personnel exposure to extreme weather conditions (example, the Fighter Index of Thermal Stress or FITS restricts work/rest cycles based on temperature and humidity)?

15.24. Have medical personnel been included in the test planning process and are they available during test execution if applicable?

15.25. If testing is conducted in the climatic lab, have fire drills been planned to include aircraft and hanger egress without power in the lab?

16. Hazardous Flight Tests. For general planning purposes, hazardous flights are those that, after every reasonable effort has been made to minimize hazards, still have factors, mission elements, or test points that could create a significant adverse public reaction in the event of a mishap; could individually or in combination increase the chance of producing a mishap; or could result in a significant impact on a major program.

16.1. Examples of factors that may be considered inherently hazardous are:

16.1.1. Operation near or beyond the extremities of the currently approved flight envelope (envelope expansion).

16.1.2. Tests involving high-energy lasers, significant quantities of high explosives, or other dangerous media as defined in AFJI 11-204.

16.1.3. Tests in which departure from controlled flight is likely.

16.1.4. Initial flights after completion of Class II modifications performed according to AFMCR 80-33 in which changes in structural integrity, aerodynamic stability, or other safety-of-flight characteristics may have occurred.

16.1.5. Tests of experimental or research aircraft.

16.1.6. Tests to check compliance with specifications (spin tests, handling qualities, etc.).

16.1.7. Low-altitude terrain-following sorties at night or in instrument meteorological conditions.

16.1.8. Tests of separation of internally-carried stores.

16.1.9. Tests requiring FTS's.

16.2. The following questions are provided as general guidance for people preparing to conduct hazardous flight tests. The questions should be of particular interest to the operations supervisor, test director, project test pilot, project engineer, and flight safety officer.

16.2.1. Have the hazards associated with this test been clearly identified?

16.2.2. Is the test hazard due to traditional methods of obtaining test data?

16.2.3. Have other methods of obtaining comparable data been examined?

16.2.4. If less hazardous methods would be practical, why were they rejected?

16.2.5. Have all means of minimizing the anticipated hazards been explored?

16.2.6. When possible, have predicted flight conditions been simulated by computer or wind tunnel techniques before flight tests?

16.2.7. Has there been sufficient time between completion of the simulation studies and the first flight test to permit the data collected to be assessed?

16.2.8. Have those data been used to modify or restrict the test points to increase the safety of the test?

16.2.9. Have all anticipated hazards and the precautions taken in response to them been documented?

16.2.10. Was this information presented to the approving commander for review before final approval of the test plan?

16.2.11. Have the test sorties been planned logically and progressively so that the least hazardous conditions are experienced and evaluated early in the program before the more hazardous ones?

16.2.12. Does the test require special instrumentation?

16.2.13. If so, has installation been properly performed and evaluated according to this pamphlet or similar means?

16.2.14. Who is the go/no-go authority for the project?

16.2.14.1. For each sortie?

16.2.14.2. Does the person in charge of no-go decisions appreciate the anticipated progress of the project and the hazards expected during each phase?

16.2.14.3. Is that person prepared to halt testing if unacceptable hazards are encountered?

16.2.14.4. At what point do the hazards of the tests outweigh the value of the data the test is providing?

16.2.14.5. Would extrapolated data be a suitable way of fulfilling the data requirement, if the hazards seem to be making further tests unjustifiable?

16.2.15. Who has been appointed to brief forthcoming hazardous tests to the test director, flight test operations personnel (including the project test pilot and the operations supervisor), and safety officers?

16.2.15.1. Have these briefings been planned for the day before each hazardous flight?

16.2.15.2. Does each briefing satisfactorily represent the extent of the hazard and the measures taken to minimize and manage the risks?

16.2.15.3. Do the briefings reflect tight control and responsible supervision?

16.2.16. Has all required support equipment for the test been obtained before test start?

16.2.17. Have the operators of special-purpose vehicles been briefed on hazards of the test?

16.2.18. Have chase pilots been briefed on the objectives of the test, the hazards anticipated, the most hazardous phase of the flight, and their actions in response to such emergency situations as structural failure, pilot disorientation, departure from controlled flight, etc.?

16.2.19. Will specific weather conditions be required to conduct the test?

16.2.19.1. If so, how will the appropriate weather data for working areas be obtained?

16.2.19.2. If weather is critical to the test, are there procedures to provide real-time meteorological data to the crews and the test director?

16.2.20. Have mission profiles been planned to maximize data collection opportunities and minimize risk factors? 16.2.21. Is there a safer way to gather the data?

16.2.21. Do all participants understand the operating limits of the test aircraft and its engines and equipment?

16.2.21.1. If deviations from established limits are required by the test, have those deviations been approved by the appropriate authority?

16.2.22. Do all participants understand the potential implications of deviating from operating limits and the likely hazards of doing so?

16.2.23. Do all participants understand the limits of their authority in conducting the test?

16.2.24. Have tests identified as hazardous been run up through the chain of command according to AFMCI 11-301, *AFMC Life Support Program*?

16.2.25. Are all crewmembers mentally and physically prepared to take part in this test?

16.2.25.1. If night flying is involved, have crew duty days and circadian rhythms been appropriately adjusted over a period of time before the scheduled test to minimize fatigue?

16.2.26. Do all participants feel that the risks accepted in conducting the test are reasonable, given the intended test environment and the present stage of development of the test aircraft or system?

16.2.26.1. Is the area selected for the test suitable?

16.2.26.2. Does it subject the public to unnecessary or avoidable risks?

16.2.26.3. Could the test crew be at risk in the event of an emergency that would require abandoning the aircraft?

16.2.27. Is there any danger of stray electromagnetic radiation?

16.2.27.1. RF fields or stray voltages detonating pylons, ejection system components or canopy jettison charges?

16.2.27.2. If so. what steps have been taken to reduce these dangers?

16.2.27.3. Have vulnerable components been shielded or isolated to the maximum extent possible?

16.2.27.4. Have the crewmembers been warned about the potential for uncommanded firing of electro-explosive devices?

16.2.28. Have any limitations on ARFF services been identified in the planning of this test? Have these limitations been passed to the appropriate agencies?

16.2.29. Have the recovery ground crew and fire chief been briefed on desired actions following a precautionary or emergency landing? For hung ordnance?

16.2.30. Have air traffic control personnel been informed of the location and nature of the hazardous test and of the aircraft involved?

16.2.31. Does the test crew consist of the minimum number of people necessary to perform the test?

16.2.31.1. Can the present number of participants be reduced further without degrading the test or compromising its results?

16.2.32. Are there any further considerations that need to be addressed before test start?

16.2.33. Are all participants satisfied that known hazards have been properly identified and managed and that the test can be conducted in reasonable safety?

17. Laser Tests . Laser safety involves systems safety and environmental health. Laser hazards involve more than just beam radiation; many laser systems require very high energy power sources and several of the fuels involved in laser systems are poisonous, toxic, or cryogenic. The following questions should be

of particular interest to the test director, operations supervisor, project engineer, project test pilot, and flight and systems safety officers:

17.1. Do the crewmembers have appropriate helmet visors or goggles to protect them from the wavelength of the onboard laser with maximum transmission at other wavelengths?

17.2. Does the laser-pointing device have mechanical stops to prevent it from pointing at the carrying aircraft?

17.2.1. Have those stops been inspected regularly and have those inspections been documented?

17.3. Has the appropriate local authority approved this laser installation and use? (This authority must survey and approve every proposed use before and after installation.)

17.4. If testing is to be performed at other than the aircraft's home base, does the local authority have all the data necessary to certify the operation at the other base?

17.5. Are there positive interlocks to prevent operation of an airborne laser on the ground if its radiation could present a hazard to people on the ground?

17.6. Has the laser beam been boresighted accurately?

17.7. How is the laser restrained from inadvertent firing?

17.8. Are high-voltage circuits shielded and capable of being rapidly discharged?

17.9. Is the laser inhibited from operating when over-temperature conditions occur?

17.10. What steps have been taken to protect the crew of safety or photo-chase aircraft from direct and reflected radiation? (This is critical when using light-gathering devices such as binoculars or camera lenses. Laser energy density reaching the eye is increased by such devices. Use of visors, goggles, etc. is essential.)

17.11. Has the target been oriented to prevent injury to participants and nonparticipants and to avoid damage to objects?

17.11.1. Does the background of the target have low reflectivity at operating wavelength?

17.11.2. Is the target fire resistant?

17.12. Is the aircraft adequately ventilated to prevent accumulation of oxides of nitrogen or other toxic or flammable gases that may result from high-voltage or chemical sources?

17.13. Is there a checklist that contains every step of the operating and firing sequence, including abort procedures?

17.14. Have restricted areas been established around the test area?

17.15. Have appropriate agencies been notified to reserve the airspace?

17.15.1. Has the owning agency coordinated the reservation of the airspace with the FAA?

17.16. Is there a cockpit-mounted device that indicates when the laser is firing?

17.16.1. Is the device designed to provide warning of an inadvertent firing?

17.17. What steps have been taken to protect the laser operate switch from inadvertent actuation?

17.18. Has a method been devised for emergency removal of power from the laser?

17.18.1. Has the method been included in the appropriate checklists?

17.19. Have all participating crews been briefed on the characteristics, capabilities, and power output of the installed laser?

17.20. What controls have been prepared to prevent dangerous illumination of air and space traffic?

17.20.1. If irradiation of aircraft or satellites is considered, have all approval requirements been met?

17.21. Has the test director coordinated the test with environmental planning at the base at which the test aircraft is assigned or where the test is to be conducted?

17.22. Has any environmental documentation required by AFI 32-7061, *The Environmental Impact Analysis Process*, been completed before test start?

17.23. Are all participants and environmental health reasonably certain the test can be conducted safely?

18. Systems Safety (General). Systems safety participation in flight test planning involves review before testing and specification compliance. This first set of questions should be considered by people conducting an overall systems safety analysis of the test project. See paragraph 19 for questions relating to specification compliance. The following questions should be of particular interest to the test director, project engineer, and the systems safety officer:

18.1. Have all required hazard analyses been performed according to MIL-STD-882C/D?

18.2. Have all hazards that relate to testing, operations, and support been identified, documented and, when practical, reduced?

18.3. Have all participants reviewed or been briefed on catastrophic (Category I) and critical (Category II) hazards? 18.4. Do participants agree with the actions that have been taken to correct them? (MIL-STD-882C/D, tasks 106, 202, 203, 204, 205, and 207.)

18.4. Have training needs for test, maintenance, and support personnel been identified and scheduled in response to identification of specific hazards? (MIL STD-882C/D, task 208.)

18.5. Are there provisions to handle discovery-type safety deficiencies?

18.5.1. Are there procedures for immediate notification of the system program office, operating command, and any activities operating hardware or software?

18.6. Have all minimizing procedures required by hazard analysis been implemented and documented (i.e., if the hazard analysis states a warning will be included in the flight manual, has it actually been included in the flight manual)?

19. Systems Safety Testing. The task of assessing specification compliance in the overall test plan can be greatly simplified by involving systems safety personnel in planning the flight test. Participants should be prepared to respond to the issues in the following questions, thereby ensuring maximum integration of system safety with the other elements of the test project:

19.1. Have the appropriate checklists from Design Handbook l-X been prepared?

19.2. Have all specification requirements for safety related devices been matched to appropriate test points?

19.2.1. If test points are not to be developed to verify compliance with safety requirements, how will compliance be demonstrated?

19.3. Does the proposed integrated systems test plan adequately demonstrate system specifications, contract end specifications, and design sheet safety requirements?

19.4. If catastrophic (Category I) or critical (Category II) hazards are identified in the course of testing, how will they be resolved?

19.4.1. Who will approve the contractor's proposal for resolution?

19.4.2. How will satisfactory resolution be demonstrated?

19.5. How will the system and test item be disposed after the test?

19.5.1. How will they be disposed at the end of their useful life?

19.5.2. Do they contain hazardous materials that will require special disposal techniques?

19.6. Will test results be used to update the appropriate design handbook? Who will be responsible for compiling results?

19.7. Have safety tests been integrated with other test requirements to the maximum extent practical?

19.8. Are all participants reasonably certain that the test adequately demonstrates compliance with all safety requirements in the specification?

19.9. Are all participants reasonably certain that the test can be conducted safely?

20. SRB Procedures. An SRB should be an integral part of the formal review of a proposed flight test. The board chairperson should select the voting members of the board. The members should be experienced with the tests to be performed but they should not be directly involved in the test program to be executed in order to maintain objectivity. Key personnel (project test pilot, project engineer, and test director) are expected to attend and may recommend other members to the chairperson, as necessary. The SRB must consider the project as a whole, preferably in sequential order of events. The SRB proceedings should have a brief description and justification of the test and then list the SRB participants, expected participants in the test, key coordinating officials and points of contact, the name and position of the official who approves the SRB results, and all identified hazards, including hazard category, probability of occurrence, and steps taken to reduce each hazard. If identifiable hazards are to be accepted during the test project, a brief justification for accepting the risk, instead of minimizing it, must be provided. (It is understood that testing of safety-related features is inherently hazardous should they fail to operate as expected; however, unless the circumstances in which they are tested are themselves hazardous (for example, a high-speed low-altitude test of automatic terrain-avoidance equipment), no further justification of the assumption of risk is necessary.) Previous checklists in this pamphlet may be used as appropriate to stimulate discussion and review. The following questions should be considered by the SRB:

20.1. Have all test hazards been identified?

20.2. Have hazards been eliminated or minimized when appropriate?

20.3. What hazards will remain essentially unabated for the purposes of the test?

20.3.1. Who authorized the assumption of risk?

20.3.2. Are any undue risks being taken?

20.4. Has the possibility of multiple failures of systems in the course of the test been recognized and addressed?

20.4.1. What actions would be required by crewmembers in response to multiple malfunctions?

20.4.2. Is there a combination of emergencies that could be catastrophic?

20.5. What is program buildup for hazardous tests associated with the project?

20.6. Is program buildup satisfactory?

20.7. Can the test be done more easily or safely by alternate methods?

20.8. Is final management review needed before the end point (the most hazardous test)?

20.9. Have allowable deviations from the test plan been addressed?

20.9.1. Do all participants understand the limits to which such deviations may be applied?

20.9.2. Do all participants know who has the authority to deviate beyond approved levels once the test plan has been finalized?

20.10. Who will make go/no-go decisions for hazardous tests?

20.11. Has the project test pilot imposed any physiological, psychological, or proficiency-related limitations on the test?

20.12. What limitations are imposed on the test by the aircraft (structure, design) engineering (of the test aircraft, test item, or test equipment), design handbook, or technical data?

20.13. Has the number of crewmembers been kept to the minimum consistent with mission accomplishment?

20.14. Will any aspect of the test present an undue hazard to ground personnel or property?

20.15. Are the appropriate ranges and restricted airspace being used for hazardous tests?

20.15.1. If supersonic flight will be required, has appropriate airspace been reserved?

20.16. Will the flight envelope be exceeded?

20.16.1. If so, has such expansion been authorized?

20.16.2. By whom?

20.17. Will a safety or photo-chase aircraft be required?

20.17.1. If so, has that aircraft's pilot been included in test planning?

20.17.2. What will the chase aircraft's duties be?

20.18. Will radar tracking, telemetry, ground-based photography, or other ground- based support be required?

20.19. Will the operational suitability of critical components be proven before the aircraft is tested in a regime in which such components may be subjected to extreme demands?

20.20. Have critical structural parts been identified?

20.20.1. Has projected usage of critical structural parts during the test been compared to their predicted life remaining?

20.20.2. If projected usage approaches or exceeds life remaining, has a test hazard analysis been prepared to identify the planned minimizing procedures (e.g., special inspection or replacement of critical parts)?

20.21. Have all ground crews (including weapons specialists, ARFF teams, and maintenance personnel) been appropriately trained?

20.22. Will any aspects of the test project be classified?

20.22.1. What steps have been taken to preserve security while providing test results to essential personnel?

20.23. Are all participants reasonably certain that the test can be conducted safely?

21. Reporting of Hazardous Tests. Comply with AFMCI 11-301.

22. Reporting of Test-Related Mishaps. Test-related mishaps, while rare, can generate significant confusion among participants and higher headquarters personnel. The immediate period following a major mishap is an emotional time, hardly conducive to elaborate determinations of accountability and responsibility. Minor mishaps can also create misunderstanding between the developing contractor and the government if clear delineation of responsibilities has not been made in advance. The general authority for determining reporting and accountability for test-related mishaps is AFI 91-204, *Safety Investigations and Reports*. However, test and evaluation master plans (TEMP) must reference MOAs that contain special provisions on ownership or mishap accountability. HQ AFMC/SEF must coordinate on these TEMPs and MOAs before test start. The ownership of test equipment test items, and even test aircraft can sometimes be questionable in the absence of documentation on the transfer of ownership (DD Form 250, **Material Inspection and Receiving Report**, etc.). While it is sometimes more expedient to sidestep such issues, particularly when a test project is time-sensitive, all participants must have a clear understanding, during all phases of testing, of the importance of knowing who owns what for what purpose. When a major accident occurs, the first questions that will likely be asked at the highest levels of the command are: Who owned the aircraft? Who was injured in the mishap? Whose property was damaged as a result of the mishap? The answers to these questions determine the course of the command's initial reactions to the mishap and enable HQ AFMC/SE (Director of Safety) to determine if an investigation under AFI 91-204 is required. It is far better to have addressed these questions before flight test start than to have to find the answers in an atmosphere of crisis. The test director must ensure that the test site has an approved pre-accident plan that has sufficient provisions for up-channel notification of mishaps. Mishaps involving classified resources should be reported directly to the appropriate system program office to arrange investigative actions. If there are no compelling security reasons for withholding information on a potentially reportable mishap, the test director must ensure the mishap is reported promptly to HQ AFMC/CC via Command Post) by OPREP-3 procedures.

23. Inter-command and Multiservice Tests. Inter-command and multiservice tests create many opportunities for misunderstanding the ownership of test aircraft or test items. Such issues should be resolved in an MOA or similar document between the testing activity and the command or service providing the resources. All such MOAs must be coordinated through HQ AFMC/SEF and LGM at least 45 days before the test start date, unless overriding operational considerations apply. When time is a factor, the MOA for that test and a justification for short notice submission should be telefaxed to HQ AFMC/ SEF and LGM for same day review.

24. Intra-command Transfer of Aircraft for Tests. Intra-command transfers of aircraft, such as an Air Force Flight Test Center aircraft transferred to Aeronautical Systems Center for use in a test project, must be done according to AFI 21-103, *Equipment Inventory, Status, and Utilization Reporting*. As with inter-command and multiservice tests, ownership and mishap accountability issues must be resolved before the first flight of the aircraft. If there is a memorandum of understanding (MOU) on the test aircraft between the losing and gaining product divisions, HQ AFMC/SEF and LGM must coordinate on that MOU according to paragraph 23.

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